CLAIMS

1.   A vehicle seatbelt apparatus provided with a winder for winding a seatbelt comprising:

collision predicting means for predicting a collision with an object of collision;

first winding control means for controlling the winder so as to wind the seatbelt at a first winding load when a collision is predicted by the collision predicting means;

emergency brake detecting means for detecting an emergency braking state; and

second winding control means for controlling the winder so as to wind the seatbelt at a second winding load which is larger than the first winding load when the emergency braking state is detected by the emergency brake detecting means.

2.   The vehicle seatbelt apparatus according to Claim 1, characterized in that the first winding control means is adapted to increase a winding load of the seatbelt by the winder to the first winding load from a moment when the collision is predicted by the collision predicting means at a first rising gradient, and

the second winding control means is adapted to increase a winding load of the seatbelt by the winder to the second winding load from a moment when the emergency braking state is detected by the emergency brake detecting means at a second rising gradient which is larger than the first rising gradient.

3.   The vehicle seatbelt apparatus according to Claim 2, characterized in

that the second rising gradient is set to a value equal to or larger than 100N/100ms.

4. The vehicle seatbelt apparatus according to Claim 2 or 3, characterized in that the first rising gradient is set to a value equal to or larger than 100N/180ms and smaller than 100N/100ms.

5. The vehicle seatbelt apparatus according to any one of Claims 1 to 4, characterized in that the second winding load is set to a value equal to or larger than 150N.

6. The vehicle seatbelt apparatus according to any one of Claims 1 to 5, characterized in that the first winding load is set to a value between 80N and 120 N inclusive.

7. The vehicle seatbelt apparatus according to any one of Claims 1 to 6, characterized in that the collision predicting means continuously detects a length from the vehicle in question to the object of collision, and predicts the collision with the object of collision based on the detected length which varies with time.

8. The vehicle seatbelt apparatus according any one of Claims 1 to 7, characterized in that the emergency brake detecting means detects the emergency braking state based on at least any one of a pressing amount, a pressing speed, and pressing force of the brake pedal and a brake hydraulic pressure.

9. A vehicle seatbelt apparatus provided with a winder for winding a seatbelt comprising:

collision predicting means for predicting a collision with an object of collision;

first winding control means for controlling the winder so as to wind

the seatbelt from a moment when the collision is predicted by the collision predicting means while increasing the winding load of the seatbelt at a first rising gradient;

emergency brake detecting means for detecting an emergency braking state; and

second winding control means for controlling the winder so as to wind the seatbelt while increasing the winding load of the seatbelt at a second rising gradient which is larger than the first rising gradient from a moment when the emergency braking state is detected by the emergency brake detecting means.

10. The vehicle seatbelt apparatus according to Claim 9, characterized in that the second rising gradient is set to a value equal to or larger than 100N/100ms.

11. The vehicle seatbelt apparatus according to Claim 9 or 10, characterized in that the first rising gradient is set to a value equal to or larger than 100N/180ms and smaller than 100N/100ms.

12. The vehicle seatbelt apparatus according to any one of Claims 9 to 11, characterized in that the collision predicting means continuously detects a length from the vehicle in question to the object of collision and detects the collision with the object of collision based on the detected length which varies with time.

13. The vehicle seatbelt apparatus according to any one of Claims 9 to 12, characterized in that the emergency brake detecting means detects the emergency braking state based on at least any one of a pressing amount, a pressing speed, and pressing force of the brake pedal and a brake hydraulic pressure.

17

14. A vehicle seatbelt apparatus provided with a winder for winding a seatbelt comprising;

collision predicting means for predicting a collision with an object of collision; and

winding control means for controlling the winder so as to wind the seatbelt at a predetermined winding load between 80N and 120N inclusive when the collision is predicted by the collision predicting means.

15. The vehicle seatbelt apparatus according to Claim 14, characterized in that the winding control means is adapted to increase the winding load of the seatbelt by the winder to the predetermined winding load from a moment when the collision is predicted by the collision predicting means at a predetermined rising gradient equal to or larger than 100N/180ms and smaller than 100N/100ms.

16. The vehicle seatbelt apparatus according to Claim 14 or 15, characterized in that the collision predicting means continuously detects a length from the vehicle in question to the object of collision, and predicts the collision with the object of collision based on the detected length which varies with time.

17. A vehicle seatbelt apparatus provided with a winder for winding a seatbelt comprising:

collision predicting means for predicting a collision with an object of collision, and

winding control means for controlling the winder so as to wind the seatbelt while increasing the winding load of the seatbelt from a moment when the collision is predicted by the collision predicting means at a predetermined rising gradient equal to or larger than 100N/180ms and

smaller than 100N/100ms.

18.   The vehicle seatbelt apparatus according to Claim 17, characterized in that the collision predicting means continuously detects a length from the vehicle in question to the object of collision and predicts the collision with the object of collision based on the detected length which varies with time.